Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9686

Eu isotope fractionation and isotope ratio shift during evolution processes of the extrusive and intrusive magma in the crust-mantle system

SEUNG-GU LEE[1] AND TSUYOSHI TANAKA[2]

[1]Korea Institute of Geoscience and Mineral Resources
[2]Nagoya University
Presenting Author: sgl@kigam.re.kr

Geochemical characteristic of the rare earth element (REE) provides us a lots of valuable information to understand the formation and evolution history of the Earth system. Particularly, europium (Eu) behavior from igneous rocks based on the chondrite normalized REE patterns have provided a valuable information to understand the evolution history of igneous rocks. For example, Eu exists in divalent and trivalent states, and Eu^{2+} can be substituted for Ca^{2+} during plagioclase feldspar fractionation in reducing magmas. This leads to positive Eu anomalies in Ca-plagioclase-rich anorthosites derived from the mantle and negative Eu anomalies in fractionated silica-rich crustal rocks. But while Eu anomalies are well known, Eu has two stable isotopes (^{151}Eu and ^{153}Eu), and Eu isotope ratios have not been compared with Eu anomalies in igneous rocks.

Lee and Tanaka [1, 2] reported a method that Eu isotope ratio can determine precisely by MC-ICP-MS using Sm internal standard (combined standard-sample bracketing and internal normalization, C-SSBIN). The authors [3] also reported that highly fractionated igneous rocks such as A-type granite and rhyolite have relatively large Eu isotope fractionation (Fig. 1). In this conference, we report that there exists an inverse relationship between Eu anomalies and Eu isotope ratios in igneous rocks, with highly fractionated granites and rhyolites having large negative Eu anomalies and negative $\delta^{153/151}$Eu values but anorthosites having large positive Eu anomalies and positive $\delta^{153/151}$Eu values. And we discuss a geochemical significance of Eu isotope fractionation during magmatic differentiation.

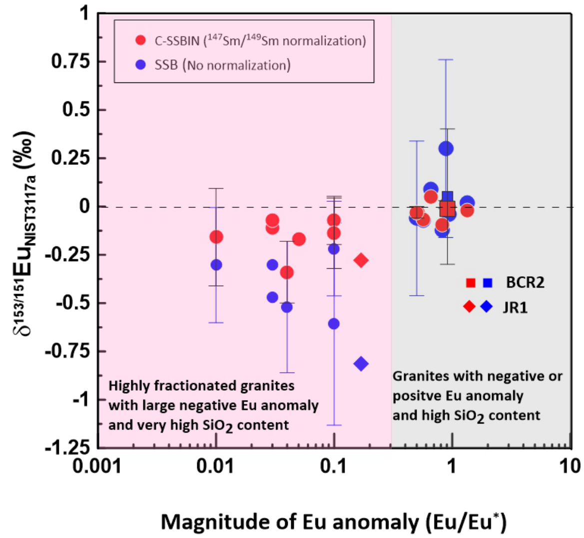

Fig. 1. Magnitide of Eu anomaly vs. Eu isotope ratio ($\delta^{153/151}$Eu relative to NIST3117a Eu, modified from [3]).

[1] Lee & Tanaka, T. (2019), *Spectrochim. Acta Part B* **156**, 42–50. [2] Lee & Tanaka (2021), Int. J. Mass Spec. 469, 116668, [3] Lee & Tanaka (2021), Geochem. J., 55/6, e9-e17.